

TFD 72-1220

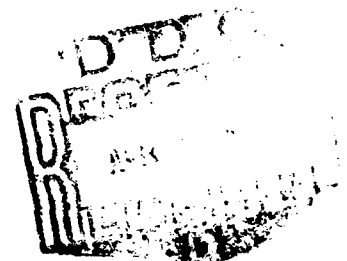
SERIAL NO.

AD909424

EMP TEST PLAN FOR EVALUATING THE SHIELDING  
EFFECTIVENESS OF THE B-1 AVIONICS BAY ACCESS  
DOOR UTILIZING A SLANT COIL SPRING AS THE EMP SHIELD

Written By:

*R. L. McClinton*  
R. L. MC CLINTOCK



Approved By:

*D. L. Koons*  
D. L. KOONS, SUPERVISOR  
SUBSYSTEM DESIGN REQUIREMENTS

This document may be further  
distributed by any method only  
with specific prior approval of  
the Air Force Systems Command

DATE  
NO. OF PAGES

19 October 1972  
14

DISTRIBUTION LIMITED TO U. S. GOVERNMENT  
AGENCIES ONLY; TEST AND EVALUATION; DATE  
APPROVED APR 23 1973. OTHER NO COSTS FOR  
THIS DOCUMENT. THIS IS BASED ON B-1  
SYSTEM AT THE AIR FORCE SYSTEMS COMMAND,  
PATTERSON AIR FORCE BASE, CALIF. 95763.



Los Angeles Division  
North American Rockwell

International Airport, Los Angeles, California 90009, (213) 670-9151

TABLE OF CONTENTS

Section		Page
	FOREWORD	iv
I	INTRODUCTION . . . . .	1
	1.1 Objective . . . . .	1
	1.2 Applicable Documents . . . . .	1
	1.3 Test Equipment . . . . .	2
II	GENERAL TEST REQUIREMENTS . . . . .	3
	2.1 Test Director . . . . .	3
	2.2 Environmental Conditions . . . . .	3
	2.3 Shielded Room . . . . .	3
	2.4 Test Procedure . . . . .	3
	2.5 Data Recording . . . . .	3
III	DETAILED TEST REQUIREMENTS . . . . .	4
	3.0 General . . . . .	4
	3.1 Shielding Effectiveness Test for EMP Seal . . . . .	4
IV	Test Report . . . . .	7

ILLUSTRATIONS

Figure No.	Title	Page
1	Test Configuration . . . . .	8
2	Shielding Effectiveness Test Setup on Simulated B-1 Avionics Bay Access Door Utilizing Slant Soil Spring As EMP Seal . . . . .	9
3	Stripline Test Setup . . . . .	10

#### FOREWORD

This test plan contains a test method for demonstrating the shielding effectiveness of the B-1 bomber avionics bay access door which utilizes a slant coil spring as the EMP shield. The avionics bay access door, with its slant coil spring, when installed, compresses against the conductive corrosion-resistant surface of the avionics bay structure to provide for the EMP seal. This test simulates the EMP door seal to be used for the B-1 avionics bay access doors. This particular effort is to be followed by a mock-up model of a complete typical bay with an access door. EMP testing will be conducted on the mock-up model when it becomes available. The test method proposed here induces various RF signals through a copper stripline (transmission line simulation) test fixture on the outboard side of the simulated B-1 access door and the current on the inboard side is measured to determine effectiveness of EMP seal.

## I INTRODUCTION

### 1.1 Objective

The objective of this EMP test is to obtain experimental data on the shielding effectiveness of a simulated B-1 bomber avionics bay access door utilizing a slant coil spring compressed against the conductive, corrosion-resistant surface of the avionics bay structure, which provides the EMP seal. EMP shielding effectiveness tests will be performed on a simulated access door installed with various spacing of the slant spring gap to provide an indication of degradation due to wear.

### 1.2 Applicable Documents

The following documents in their exact issue are applicable to this test plan:

- a. Operating Manual for Hewlett-Packard: Model 8553B, Spectrum Analyzer RF Section, Model 8552A, Spectrum Analyzer IF Section, Model 141T, Display Section, Model 8443A, Tracking Generator Counter.

- b. Operating Manual for RF Communications Inc.: 805 RF Amplifier;  
RF Powerlab Inc., Bellevue, Washington.
- c. Operating Manual for Tektronix Oscilloscope Camera C-13, Type 191  
Instant Amplitude Signal Generator; Tektronix Inc., Beaverton, Oregon.
- d. Test Panel - EMP Sealing Avionics Bay Access Doors, North American  
Rockwell Drawing L9300872, B-1 Division, LA International Airport.
- e. Stripline RF Joint Test Fixture, B-1 Division, North American  
Rockwell, TFD 72-1221.

### 1.3 Test Equipment

Acceptable results are contingent upon the use of the following equipment or equivalent and material:

#### Measuring Equipment

a.	<u>Type</u>	<u>Manufacturer and Model</u>
a.	Oscilloscope	Hewlett-Packard 141 Display unit
b.	Spectrum Analyzer	Hewlett-Packard 8553B RF Section Hewlett Packard 8552A IF Section
c.	Tracking Generator	Hewlett-Packard 9443A Counter
d.	RF Amplifier	RF Communications Inc. 805 Amplifier
e.	Oscilloscope Camera	Tektronix C-13 Camera
f.	Time Domain Reflectometer	Hewlett Packard 1415A
g.	Attenuators Attenuators	Weinschel Engineering 693-10 American Electronic Labs Models AFA-01, -02, -03, -06, -10, -20
h.	Striplines	Test Fixture Transmission Lines of Various Sizes Originated At NR/Los Angeles Division

## II GENERAL TEST REQUIREMENTS

### 2.1 Test Direction

Any changes to, or deviations from, this test plan must be approved by the Subsystem Design Requirements Group.

### 2.2 Environmental Conditions

Tests will be performed under ambient laboratory conditions.

### 2.3 Shielded Room

Tests on the simulated B-1 avionics bay access door shall be conducted in the welded steel shielded room of the Electrical Department Test Laboratory.

### 2.4 Test Equipment Operation

All test equipment shall be operated in accordance with the manufacturer's instructions. Prior to testing, a check will be made to insure all connectors are mated and all monitoring equipment is in place and properly operating.

### 2.5 Data Recording

Data taken during the tests shall be recorded in a test book. Polaroid photographs of scope traces shall be taken where appropriate. Retain and log all photographs consistent with test measurement points. The shielding effectiveness data results shall be the ratio of the input voltage reference (reference figure 3) to the output voltage (leakage) (reference figure 2). The Electrical Department Test Laboratory shall provide these results in a graph of SE in db attenuation versus frequency of applied voltage.

### 3. DETAILED TEST REQUIREMENTS

#### 3.0 General

This EMP test is conducted to determine shielding effectiveness of simulated B-1 avionics bay door seal. This concept consists of a beryllium copper, tin-plated, slanted spring coil compressed against conductive corrosion-resistant surface of the structure providing the EMP seal. In order to facilitate report preparation, the test lab will provide a special test data book for this test. Measurements, remarks and oscilloscope pictures will be put into this special test book. Oscilloscope pictures are to be identified with the date, TR number, sample ID, input and output trace designation, log reference levels, scale, frequency and current probe.

#### 3.1 Shielding Effectiveness Test for EMP Seal

Tests shall be accomplished with the test panel place. Install access door with tridair fasteners tightened down secure. fixture transmission lines will be mounted in section A. Reference figures 1, 2 and 3.

3.1.1 Perform shielding effectiveness (SE) measurements at continuous wave frequencies of 10 KHz, 100 KHz, 1 MHz, 10 MHz and 100 MHz with test fixtures installed in section A. Reference figures 1, 2 and 3. Take pictures with oscilloscope camera of scope trace at all frequencies. Record measurements. Properly identify all pictures.

3.1.2 Repeat para. 3.1.1 with test fixture in section B.

3.1.3 Repeat para. 3.1.1 with test fixture in section C.

3.1.4 Repeat para. 3.1.1 with test fixture in section C'.



- 3.1.5 Repeat para. 3.1.1 with test fixture in section B'.
- 3.1.6 Repeat para. 3.1.1 with test fixture in section A'.
- 3.1.7 Repeat para. 3.1.1 with test fixture in section D.
- 3.1.8 Repeat para. 3.1.1 with test fixture in section E.
- 3.1.9 Place a test fixture across door from section B to section B'. Repeat para. 3.1.1.
- 3.1.10 Remove the access door from the test panel. Install .091 (approximately) shims, verified with a micrometer. Reinstall door and tighten all tridair fastners.
- 3.1.11 Perform shielding effectiveness measurements through the frequency range of 10 KHz to 100 MHz, with the test fixture installed across the door, section B to B'. Take pictures of the scope trace with oscilloscope camera. Record measurements; identify all pictures properly.
- 3.1.12 Remove test fixture from across the door at section B to B'. Install test fixture at B' only.
- 3.1.13 Repeat para. 3.1.1 with test fixture in section B'.
- 3.1.14 Place test fixture on door at section B only. Repeat para. 3.1.1 with test fixture in section B.
- 3.1.15 Review test data at this point in the test. Compare data of section B, B' without shims with data from section B to B' with shims. If the shielding effectiveness results are within 6 db of attenuation of each other when comparison is made, no further testing is required. If the test results are beyond 6 db difference, continue the test. Proceed to para. 3.1.16.

- 3.1.16 Perform this test only if there is a difference of greater than 6 db of attenuation between the SE test results of access door without shims and with shims for section B and B'. Remove access door. Remove .091 shims. Install .046 (approximately) shims, verified with a micrometer. Reinstall access door.
- 3.1.17 Install test fixture in section B. Repeat para. 3.1.1 with test fixture in section B.
- 3.1.18 Install test fixture in section B'. Repeat para. 3.1.1 with test fixture in B'.
- 3.1.19 Install a test fixture across door B to B'. Repeat para. 3.1.1 with test fixture across door from section B to B'.
- 3.1.20 End of test.

#### IV TEST REPORT

A test report shall be submitted after completion of the testing. The report shall include, but not be limited to, such details as:

- a. Nomenclature and model number of test and support equipment.
- b. Description of the procedure used.
- c. Test frequency.
- d. Test voltages/current.
- e. Photographs of the test set-up.
- f. Test data.

Test Configuration

TFD 72-1220

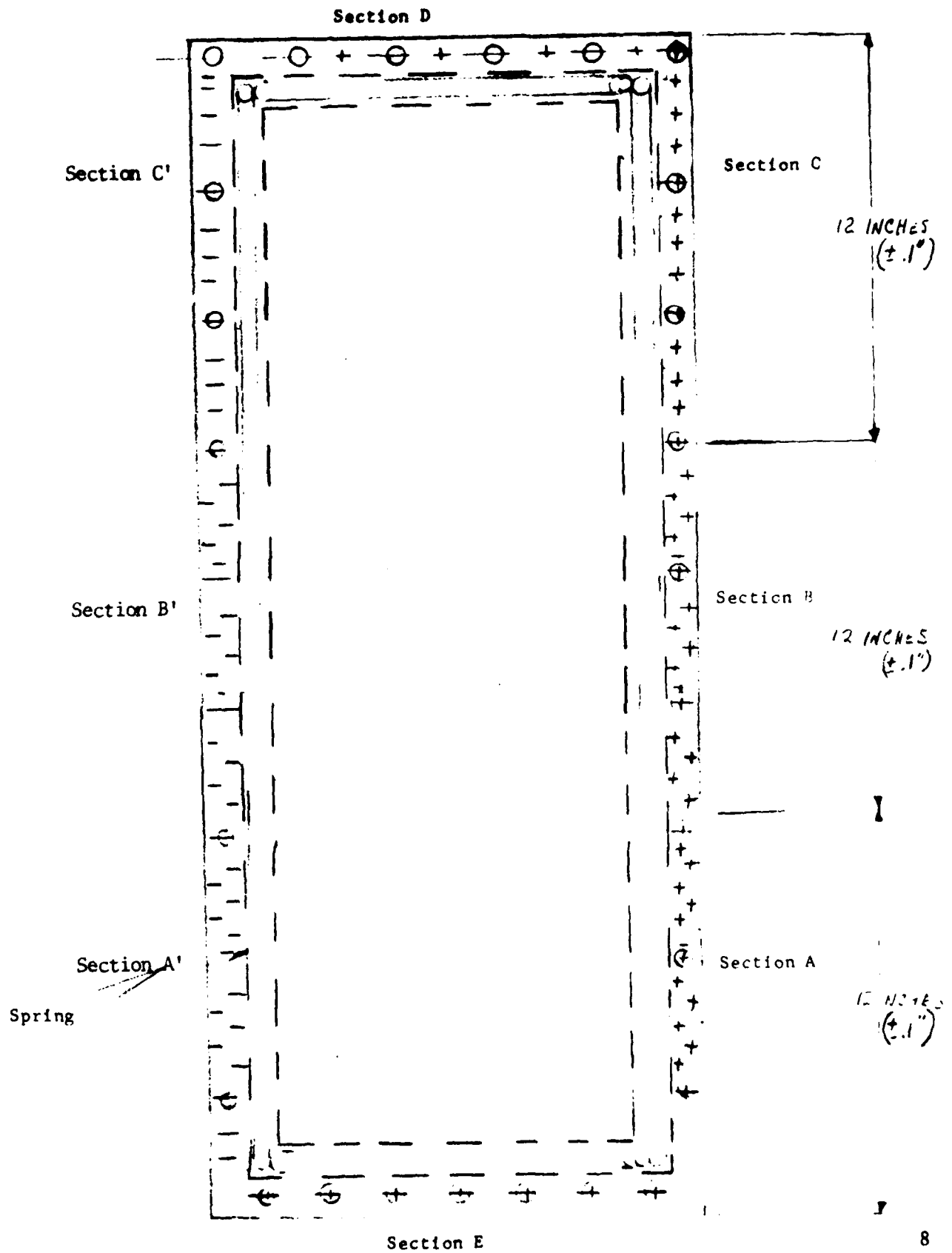
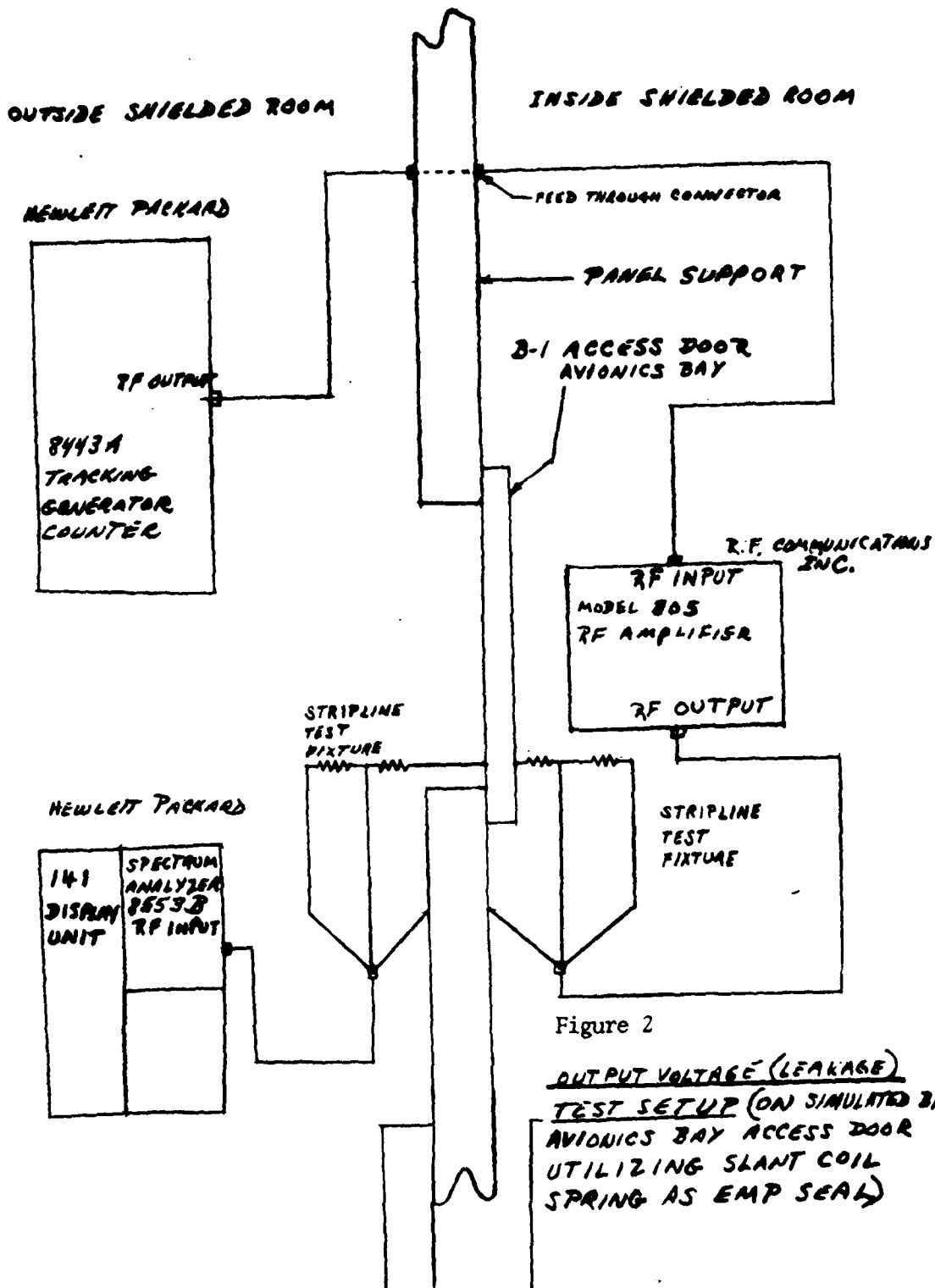


Figure 1

NORTH AMERICAN ROCKWELL CORPORATION



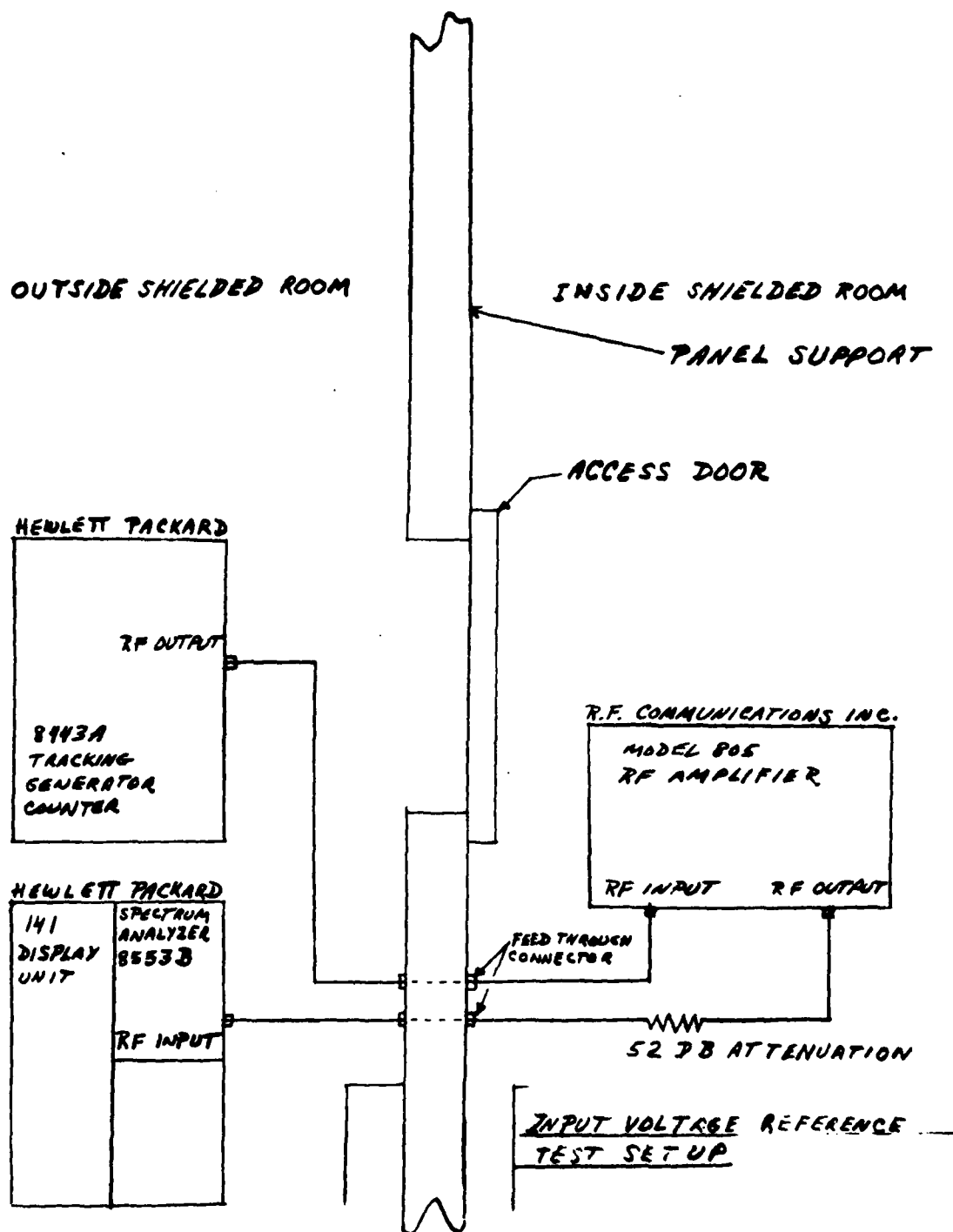


Figure 3

B-1 TIC  
D/299 BA08 11

ACCESSION NUMBER L-109066 PUB DATE 19 Oct 72

L-678901-1

02/02/73

MICROFICHE 2

**TITLE**

EMP TEST PLAN FOR EVALUATING THE SHIELDING  
EFFECTIVENESS OF THE B-1 AVIONICS BAY ACCESS DOOR  
UTILIZING A SLANT COIL SPRING AS THE EMP SHIELD

MCCLINTOCK, R. L.

North American Rockwell Corp., Los Angeles,  
Calif. Los Angeles Div.

DOCUMENT NUMBER TPD-72-1220

SECURITY CLASS. Unclassified

**DESCRIPTORS**

\*Electromagnetic Pulses; \*Sealing; \*Shields;  
\*Coating

**IDENTIFIERS**

\*B-1; \*EMP

**ABSTRACT**

The objective of this EMP test is to obtain experimental data on the shielding effectiveness of a simulated B-1 bomber avionics bay access door utilizing a slant coil spring comprasant against the conductive, corrosion-resistant surface of the avionics bay structure, which provides the EMP seal. EMP shielding effectiveness tests will be performed on a simulated access door installed with various spacing of the slant spring gap to provide an indication of degradation due to wear.

DISTRIBUTION LIMITED TO U. S. GOVERNMENT  
AGENCIES ONLY; TEST AND EVALUATION: 100%  
APPLIED: 2579  
THIS DOCUMENT IS AVAILABLE FROM THE  
SYSTEMS INFORMATION CENTER, RANDOLPH AFB,  
TEXAS

RELEVANCE FACTOR 1